DOCUMENT RESUME

ED 172 783 IR 007 414

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TITLE Time Management Skill Training and Procedures for Increasing Student Efficiency in a Computer-Managed Instructional Environment.
PUB DATE Apr 79
NOTE 11p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, California, April 1979)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Processes; *Computer Managed Instruction; *Educational Improvement; Formative Evaluation; Learning Modules; Military Training; *Summative Evaluation; *Teaching Techniques; Time Perspective

ABSTRACT

This project designed and developed a specialized student skill module for providing rudimentary time management skills, and implemented and evaluated the effectiveness of this skill module for reducing course completion times and promoting positive student attitudes in the context of a computer-based progress management system. Evaluation subjects were Air Force trainees in a course taught under the Advanced Instructional System. Results of the 2-phase evaluation indicated that the combination of time management skill training plus progress management procedures reduced completion times by 11.2 percent as compared to a control condition having neither of these components, and by approximately nine percent as compared to a condition having only the progress management component. References and evaluation data are appended. (Author/JEG)

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ED172783

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Time Management Skill Training and Procedures for Increasing Student Efficiency in a Computer-Managed Instructional Environment*

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, April 1979. Session No. 16.23.

*The work described here will also be reported in

Judd, W. A., McCombs, B. L. & Dobrovolny, J. L. Time management: Increasing student efficiency in computer-managed instruction, in H. F. O'Neil, Jr., & C. D. Spielberger (Eds.), Learning strategies: Issues and procedures, New York: Academic Press, in press.

IR007414

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Time Management Skill Training and Procedures for Increasing Student Efficiency in a Computer-Managed Instructional Environment

Techniques for teaching rudimentary time management skills were evaluated. It was hypothesized that this training would reduce course completion times in the context of a computer-based progress management system. Subjects were Air Force trainees in a course taught under the Advanced Instructional System. Results of the two-phase evaluation indicated that the combination of time management skill training plus progress management procedures reduced completion times by (a) 11.2 percent as compared to a control condition having neither of these components and (b) by approximately nine percent as compared to a condition having only the progress management component.

The project which this paper describes was conducted under the auspices of the Defense Advanced Research Projects Agency (DARPA), an R & D organization within the Department of Defense. One DARPA program has been concerned with the investigation of learning strategies, methods and materials for teaching students cognitive, affective, or motor skills necessary for efficient performance in military and civilian training environments. The present work focuses on the specific skill of time management in the context of the Air Force Advanced Instructional System (AIS), a computer-managed instructional (CMI) system. The instructional methods and procedures employed were intended to be sufficiently general such that they could be implemented in other individualized or computer-managed instructional environments which have some type of completion time prediction capability.

Objectives: The objectives of this project were to (1) design and develop a specialized student skill module for providing rudimentary time management skills and (2) implement and evaluate the effectiveness of this skill module for reducing course completion times and promoting positive student attitudes in the context of a computer-based progress management system.

Perspective: While considerable effort, both within and external to military technical training, has been devoted to improving the hardware, software, and instructional materials components of CMI systems, the problem of preparing the student to utilize the system efficiently has received little attention. Experience with the AIS has indicated, moreover, that few students possess the habits, skills or strategies that enable them to use

the capabilities of CMI systems effectively. A number of other studies support this position (e.g., Bond, 1971, Carpenter, 1971, McCombs & McDaniel, 1978; McCombs & Siering, 1976; Smith, 1973; Spielberger et al, 1972) and have suggested the need to orient students to appropriate strategies for adapting to and profiting from this new learning environment. Prior to this study, however, there do not appear to have been any systematic attempts to identify the skills to be taught or the implementation and evaluation procedures.

Tangential evidence indicates that behavioral self-control techniques can significantly improve the performance of under-achieving students (Grovemen, Richards & Caple, 1977) and that self management skills are important not only in independent learning environments, such as CMI (Seidel et al., 1975), but in cognitive self change programs (Richardson, 1976) as well. Thus, there is evidence for the viability of training techniques for effecting positive changes in students' perceived locus of responsibility or self-regulatory behavior.

With the exception of several popular "self-help" books (Lakein, 1974, Mackinzee, 1972), there have been few published approaches to teaching time management skills. Several studies, however, have focused on improving student attitudes toward computer-based instructional systems. Generally, this research indicated that students' attitudes can be improved by writing materials which have a degree of warmth and show sensitivity to student needs (Kopstein & Seidel, 1972) and which emphasize self-management and/or self determination (goal setting) skills (Khan & Weiss, 1973). The research on goal setting (Johnson, Salop & Harding, 1972; Colton, 1974; Gaa, 1971) generally indicates that students who set goals complete learning materials in less time than students who do not set goals. In addition, the "costs" of early task-relevant skill training were found to be quickly amortized when students began using these skills to improve their performance (Anderson, 1976), suggesting that early training in time management could effectively reduce total training time.

Data Source: The evaluation subjects were male and female Air Force trainees enrolled in the 6 week Inventory Management (IM) course between March, 1977 and March, 1978. Student ages ranged from 18 to 26 years and the number of cases available for analysis ranged from 232 to 375 in Phase I of the summative evaluation and from 16 to 79 in Phase II.

Methodology: Students from two Air Force technical training courses were interviewed concerning their problems in a CMI environment and with time management in particular. A Time Management Module and an accompanying set of procedures were designed on the basis of the interview results and the characteristics of the existing AIS Progress Management Software.

The Management Software generated a target course completion time for each student based on the student's scores on a battery of cognitive and affective measures administered at course entry. Daily feedback was provided for both the student and the learning center instructor, concerning progress towards this goal.

The module materials described the concept of time management, its importance in military technical training, reasons why students fail to keep up with their target rates, and ways of dealing with these problems. Students were taught a progress charting technique--a self-monitoring device designed to promote practice of time management skills. Classroom procedures included maintenance of the progress chart and student/instructor progress counseling sessions.

A formative evaluation of the Time Management Module was conducted in both small group tryouts and in an operational tryout in a special version of the course. Based on these data, the module and criterion test were revised. Learning center procedures remained essentially unchanged. Large scale evaluation activities were conducted in two phases. Phase I was concerned with the combined effect of the Student Progress Management Software and the Time Management Module, while Phase II investigated the effect of the module per se in the presence of Progress Management.

The first 57 class days of Phase I constituted a "no progress management" condition during which neither Progress Management nor the module were implemented. Students who began the course and completed one or more blocks of instruction during this period constituted the control group. During the next 57 class days, Progress Management was in effect and the module was administered as one of the student's first assignments in the course. Students entering the course and completing one or more blocks during this period constituted the evaluation group.

During Phase II, two versions of the course were defined, an evaluation version, containing the Time Management Module as the student's first assignment in the course, and a control version in which students were given a placebo handout explaining the operation of the Progress Management Software. This software was in effect in both versions.

Results and Conclusions: During Phase I, the major question of interest was whether the combination of Progress Management and Time Management Module skill training would result in significant reductions in block and course completion times. Phase I summative evaluation data indicated that students in the evaluation group completed the six blocks of the course in 11.2 percent less time than did the comparable control group ($p < .01$; see Table 1). This 11.2 percent savings represents 2.87 fewer days spent in a learning center by the average student. It also includes the time which students took to complete the Time Management Module, which was an average of 42 minutes. Evaluation group test scores were consistently lower than those of the control group and failure rates were significantly higher ($p < .05$) in two of the six blocks. Given the context of criterion referenced instruction, however, this is not considered to be a critical problem since the shorter course completion times included time spent in post-failure remediation. Student attitudes towards CMI were not statistically different for the two groups.

The major question of interest in Phase II concerned whether the Time Management Module per se, in the presence of Progress Management, contributed

significantly to training time reductions. The Phase II data indicated a substantial and significant ($p < .014$) time savings attributable to the Time Management Module--14.77 percent for students who completed all six blocks (see Table 2). Since so few students completed the full course during the evaluation period, however, a more conservative estimate would be approximately nine percent. Comparisons made in the second and third blocks, both of which had reasonably large n's, showed a 9.1 percent time savings when the control and evaluation groups were compared. Differences in test scores between the evaluation and the control groups were not statistically significant nor were the failure rates of the two groups. Student attitudes during Phase II were more positive than during Phase I.

A comparison between the two phases also indicated that the combined effect of the Management Software plus module increased over time. That is, four months elapsed between the end of Phase I and the beginning of Phase II and a comparison of the Phase I and II evaluation groups indicated that the combined effect of the Management Software plus module resulted in an additional 4.27 hour reduction (7.1 percent) during this period in the two blocks where there were adequate data for extensive evaluation (see Table 3). Thus, the total effect of the full Management Component (software plus module) given a period of time in which to take effect, was an 18.5 percent reduction in completion time for these two blocks.

Two major conclusions can be drawn from these results. First, both parts of the total Progress Management Component contributed to improvements in student efficiency and the contributions of each appear to be roughly equivalent. Second, the effects of the total Progress Management Component continued to increase over time.

The increasing effect of the full Progress Management Component over time is particularly interesting. Not only did block times continue to decrease as a function of time, but the initial negative effect on levels of achievement was washed out. The block test scores and failure rates of Phase II evaluation group students were approximately equivalent to those observed prior to implementation of Progress Management and student's opinions of the system improved as their experience with it increased.

Educational Importance of the Study: This study demonstrates that provision of predicted course completion targets and progress feedback to students combined with brief training in time management skills can lead to significant training time savings in a CMI environment. In addition, it appears that the brief time management skill training was responsible for enhancing the effect of the Progress Management Software. More generally, the results imply that short skill modules appended to the beginning of a course can have an extreme impact on reducing technical training costs if means are provided to maintain practice of the skill behaviors throughout the course. These findings should serve as an impetus to additional research in this area of specialized skill training.

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TABLE 1

BLOCK TIMES AND SCORES FOR PHASE I
SUMMATIVE EVALUATION AND CONTROL GROUPS

VARIABLE	EVALUATION N	$\bar{X}$	SD	CONTROL N	$\bar{X}$	SD	EVALUATION - CONTROL	PERCENTAGE CHANGE
Block 1 Time[1]	300	20.00	6.93	276	23.75	8.12	- 3.75	-15.8
Block 2 Time	274	26.05	7.62	233	29.03	9.03	- 2.98	-10.3
Block 3 Time	246	34.10	9.55	190	39.50	11.68	- 5.40	-13.7
Block 4 Time	243	21.08	5.37	180	22.58	6.42	- 1.50	- 6.6
Block 5 Time	197	23.15	5.52	152	25.88	8.12	- 2.73	-10.5
Block 6 Time	196	16.23	4.32	174	18.92	3.63	- 2.69	-14.2
Total Time, Blocks 1-6	75	136.13	31.33	115	153.33	31.52	-17.20	-11.2
Block 1 Score[2]	359	80.3	10.8	280	82.5	10.3	- 2.2	
Block 2 Score	320	79.8	12.8	251	82.3	11.8	- 2.5	
Block 3 Score	304	74.1	11.3	208	77.6	10.2	- 3.5	
Block 4 Score	269	81.1	9.7	192	83.4	9.1	- 2.3	
Block 5 Score	233	76.7	14.6	163	80.9	10.1	- 4.2	
Block 6 Score	223	82.7	10.7	155	84.8	9.9	- 2.1	

1. Times shown in hours.
2. Scores shown as percentages.

TABLE 2

BLOCK TIMES FOR PHASE II
SUMMATIVE EVALUATION AND CONTROL GROUPS

VARIABLE	EVALUATION N	EVALUATION $\bar{X}$	EVALUATION SD	CONTROL N	CONTROL $\bar{X}$	CONTROL SD	EVALUATION - CONTROL	PERCENTAGE CHANGE
Block 1 Time[1]	77	19.51	6.23	76	19.54	6.29	- 0.03	- 0.15
Block 2 Time	59	23.77	7.52	66	26.10	7.93	- 2.33	- 8.93
Block 3 Time	39	32.11	10.26	62	35.39	11.01	- 3.28	- 9.27
Block 4 Time	28	18.45	5.76	48	21.70	5.64	- 3.25	-14.98
Block 5 Time	20	19.01	5.91	36	22.36	5.96	- 3.35	-14.98
Block 6 Time	16	11.75	2.63	27	15.12	4.72	- 3.37	-22.29
Total Time, Blocks 1-3	34	74.11	23.13	53	78.26	21.77	- 4.15	- 5.30
Blocks 1-4	21	86.10	24.64	38	95.54	25.23	- 9.44	- 9.88
Blocks 1-5	13	95.19	26.69	25	108.94	25.52	-13.75	-12.62
Blocks 1-6	10	101.22	18.23	19	118.76	23.64	-17.54	-14.77

1. Times, in hours, adjusted for differences in predicted course completion time.

TABLE 3

TIME SAVINGS IN BLOCKS 2 AND 3
ATTRIBUTABLE TO VARIOUS TREATMENTS

Treatment	Data Source	Time Difference in Hours	Percentage Time Savings
Management Software plus Module	Phase I Control Minus Phase I Evaluation	8.38	12.2
Management Software Only	Not Available	--	--
Module Only	Phase II Control minus Phase II Evaluation	5.61	9.1
Management Software plus Module over time	Phase I Evaluation - minus Phase II Evaluation	4.27	7.1
Management Software plus Module plus effects of time	Phase I Control minus Phase II Evaluation	12.65	18.5
Management Software plus effects of time	Phase I Control minus Phase II Control	7.04	10.3
Module plus effects of time	Not Available	--	--